

CLAIMS

I claim:

1. A method for reducing nitrate concentration in wastewater in a wastewater treatment apparatus configured to define an aeration zone and a quiescent zone,
5 wherein wastewater flows into said aeration zone, wherein said wastewater treatment apparatus further comprises at least one gas outlet positioned within said aeration zone, said gas outlet providing gas flow into said aeration zone when wastewater is present in said aeration zone, said method comprising the step of substantially ceasing gas flow into said aeration zone for a nitrate reduction period, and during said nitrate reduction period, intermittently mixing said wastewater in said aeration zone. .
2. The method according to claim 1 wherein said intermittently mixing step comprises pulsing gas into said aeration zone through said at least one gas outlet.
3. The method according to claim 1 wherein said intermittently mixing step comprises flowing gas through said at least one gas outlet at a sufficient flow rate to mix said wastewater.
4. The method according to claim 1 wherein said intermittently mixing step comprises flowing gas through said at least one gas outlet at predetermined
20 mixing intervals for a predetermined mixing period.
5. The method according to claim 4 where said predetermined mixing intervals comprise a period between about 10 minutes and about 20 minutes.

6. The method according to claim 4 wherein said predetermined mixing period comprises about 1 minute.
7. The method according to claim 1 wherein said wastewater treatment apparatus comprises an inlet configured to deliver wastewater to said aeration zone, said inlet positioned within said tank so as to mix said wastewater near the bottom of said tank.
8. The method according to claim 7 wherein said inlet is positioned near said bottom of said wastewater treatment apparatus and configured to prevent incoming wastewater from bypassing said aeration zone into said quiescent zone.
9. The method according to claim 1 wherein said nitrate reduction period is between about 1 and about 2 hours.
10. The method according to claim 1 further comprising the step of measuring the dissolved oxygen level of the wastewater within said wastewater treatment apparatus, wherein said gas flow into said aeration zone is ceased when said measured dissolved oxygen level is in the range of 2.0 mg/l to .5 mg/l.
11. A method for reducing the nitrate concentration of wastewater in a wastewater treatment apparatus configured to define an aeration zone and a quiescent zone, wherein said wastewater treatment apparatus further comprises at least one gas outlet positioned within said aeration zone, said gas outlet providing gas flow into said aeration zone when wastewater is present in said aeration zone, said method comprising the steps of (a) substantially ceasing gas flow into said

aeration zone for a nitrate reduction period during periods of heavy flow and (b) intermittently mixing said wastewater within said aeration zone during said nitrate reduction period..

12. The method according to claim 11 wherein said nitrate reduction period
5 comprises between about 1 and about 2 hours.

13. The method according to claim 11 wherein said intermittently mixing step
comprises pulsing gas into said aeration zone through said at least one gas
outlet.

14. The method according to claim 11 wherein said intermittently mixing step
comprises flowing a sufficient amount of gas through said at least one gas outlet
at a sufficient flow rate to prevent suspended particles within said wastewater
from settling.

15. The method according to claim 11 wherein said intermittently mixing step
comprises flowing gas through said at least one gas outlet at predetermined
mixing intervals for a predetermined mixing period.

16. The method according to claim 15 where said predetermined mixing intervals
comprise a period between about 10 minutes and about 20 minutes.

17. The method according to claim 15 wherein said predetermined mixing period
comprises about 1 minute.

18. The method according to claim 11 wherein said wastewater treatment apparatus
comprises an inlet configured to deliver wastewater to said aeration zone, said

inlet positioned within said tank so as to prevent suspended particles in said wastewater in said aeration zone from settling.

19. The method according to claim 11 wherein said inlet is positioned near said bottom of said wastewater treatment apparatus and configured to prevent incoming wastewater from bypassing said aeration zone into said quiescent zone.

20. A method for reducing nitrate concentration in wastewater in a wastewater treatment apparatus configured to define an aeration zone and a quiescent zone, said apparatus further comprising a dissolved oxygen monitor positioned to monitor the dissolved oxygen levels of said wastewater in said aeration zone, said wastewater treatment apparatus comprising at least one gas outlet providing gas to said aeration zone, said method comprising the steps of:

- (a) monitoring the dissolved oxygen level in said aeration zone;
- (b) ceasing gas flow into said aeration zone when a said dissolved oxygen level falls below a predetermined dissolved oxygen level; and,
- (c) resuming gas flow into said aeration zone when a second predetermined threshold has been reached.

21. The method according to claim 20 wherein said predetermined oxygen level is in the range of 2.0 mg/l to .5mg/l.

22. The method according to claim 20 wherein said second predetermined threshold is between about 1 and about 2 hours of elapsed time.

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23. The method according to claim 20 wherein said second predetermined threshold is a dissolved oxygen level of about 1.5 mg/l.
24. The method according to claim 20 further comprising the step of mixing said wastewater in said aeration zone.
25. The method according to claim 20 wherein said mixing step comprises pulsing gas into said aeration zone through said at least one gas outlet.
26. The method according to claim 20 wherein said mixing step comprises flowing gas through said at least one gas outlet at a sufficient flow rate to prevent suspended particles within said wastewater from settling.
27. The method according to claim 20 wherein said mixing step comprises flowing gas through said at least one gas outlet at predetermined mixing intervals for a predetermined mixing period.
28. The method according to claim 27 where said predetermined mixing intervals comprise a period between about 10 minutes and about 20 minutes.
29. The method according to claim 27 wherein said predetermined mixing period comprises about 1 minute.
30. The method according to claim 20 wherein said wastewater treatment apparatus comprises an inlet configured to deliver wastewater to said aeration zone, said inlet positioned within said tank so as to prevent suspended particles in said wastewater in said aeration zone from settling.
31. The method according to claim 30 wherein said inlet is positioned near said bottom of said wastewater treatment apparatus and configured to prevent

incoming wastewater from bypassing said aeration zone into said quiescent zone.

32. A method for reducing nitrate concentration in wastewater in a wastewater treatment apparatus configured to define an aeration zone and a quiescent zone, said apparatus further comprising a dissolved oxygen monitor positioned to monitor the dissolved oxygen levels of said wastewater in said aeration zone, said wastewater treatment apparatus comprising at least one gas outlet providing gas to said aeration zone, said method comprising the steps of:

- (a) monitoring the dissolved oxygen level in said aeration zone;
- (b) ceasing gas flow into said aeration zone when a predetermined dissolved oxygen level has been reached; and,
- (c) mixing said wastewater in said aeration zone.

33. The method according to claim 32 further comprising the step of flowing gas into said aeration zone when a second predetermined threshold has been reached.

34. The method according to claim 32 wherein said predetermined oxygen level is 2.0 mg/l.

35. The method according to claim 32 wherein said second predetermined threshold is between about 1 and about 2 hours of elapsed time.

36. The method according to claim 32 wherein said second predetermined threshold is a dissolved oxygen level of about 1.5 mg/l.

37. The method according to claim 32 wherein said mixing step comprises pulsing gas into said aeration zone through said at least one gas outlet.

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38. The method according to claim 32 wherein said mixing step comprises flowing gas through said at least one gas outlet at a sufficient flow rate to prevent suspended particles within said wastewater from settling.
 39. The method according to claim 32 wherein said mixing step comprises flowing gas through said at least one gas outlet at predetermined mixing intervals for a predetermined mixing period.
 40. The method according to claim 39 where said predetermined mixing intervals comprise a period between about 10 minutes and about 20 minutes.
 41. The method according to claim 40 wherein said predetermined mixing period comprises about 1 minute.
 42. The method according to claim 32 wherein said wastewater treatment apparatus comprises an inlet configured to deliver wastewater to said aeration zone, said inlet positioned within said tank so as to prevent suspended particles in said wastewater in said aeration zone from settling.
 43. The method according to claim 42 wherein said inlet is positioned near said bottom of said wastewater treatment apparatus and configured to prevent incoming wastewater from bypassing said aeration zone into said quiescent zone.